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ABSTRACT

Based in part on the experience of the British Open University, this brief essay on the use of videodisc technology in the schools begins by describing the features of videodiscs and discussing potential uses of this technology at the elementary and secondary education levels. It is suggested that the availability of good interactive video material will dictate its use in the schools, and it is pointed out that further use of this technology at these levels will require teacher training. Some uses for the technology which exploit its unique characteristics are suggested. (3 references) (EW)

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USES OF VIDEODISCS IN SCHOOLS

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1. Videodisc technology

1.1. Advanced videodisc technology systems allow up to 54,000 single still-frames with full colour to be stored on one side of a disc. Each frame can be individually identified and accessed almost instantaneously. Normal film speeds run at 25 frames per second, so a single disc could hold 36 minutes of motion, or a combination of, say, 20 minutes of motion and 24,000 stills.

1.2. Frames can be played at various speeds, from stepping frame by frame, through slow motion, up to normal and fast speeds. Two high quality sound-tracks can be synchronised with the visuals, but only when played at normal speed.

1.3. The user interacts with the videodisc via a keypad with commands such as play, fast forward, slow forward, fast reverse, still frame, search (for a specific frame whose number can be typed in from the keypad). With an index to the disc, the user therefore has full control over the display.

1.4. Because the laser-based systems use light to read the disc, there is no mechanical contact. Therefore disc life and quality will not be affected by constant use. Picture and sound quality, even on cheaper machines, are good. The low-cost and simpler domestic VHD models retail at around £250, the cheapest Laservision models at £500 and the more advanced commercial machines with a computer interface cost between £900 and £2000.

1.5. Any player that has an RS232 interface can be connected to a computer, and therefore controlled by a computer program. This applies not only to videodisc players, but also to the more advanced videocassette players, audio-cassette players and compact disc players. This means that video and audio can be used to enhance computer-based learning programs, and conversely, computer programs can control the use of video and audio to present information interactively.

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2. The Open University experience

2.1. The first OU attempt to use interactive video employed a videocassette player interfaced to an Apple microcomputer. An existing Open University TV programme was divided into sections each of which could be accessed by the student via a teaching program. The program also allowed the student to run a short computer-based tutorial with test exercises for each section. Thus the student was able to call up video teaching material or computer-based exercises as they wished in order to learn the material. The package was evaluated at Summer School and proved feasible and successful for students in terms of their performance on a related test (Laurillard 1984).

2.2. The OU's first fully interactive educational videodisc was made for the T252 Structure of Materials summer school in 1984, by a team drawn from the Technology Faculty, the Academic Computing Service, the BBC/OUPC, and the Institute of Educational Technology. This also used an existing TV programme which was edited to provide a narrative framework for the solution of a real-world problem in the structure of materials. Additional film was shot and a series of computer-based tutorials written to guide the student through the steps of the problem. The package was evaluated at Summer School, and some changes were made, mainly in the direction of giving greater control to the students. The package proved successful in terms of students' reception of it and is still being used (Laurillard 1985). The disc won the Philips prize for best videodisc in 1984.

2.3. The BBC OUPC is working on a number of externally funded videodiscs including a disc on the Management of Stress for MSC, and a disc on Exercise Skills for use in leisure centres.

2.4. The OU has been approached several times by commercial organisations asking for help with the development of interactive videodiscs, and this help is usually offered, if at all, on a consultancy basis. Staffing in this area is insufficient for the University to provide anything resembling an interactive video unit to support such ventures. University staff have collaborated with organisations such as ABTA, Barclays Bank and Shell on the design of interactive videodiscs for training.

2.5. Currently, one course team is in the process of planning a videodisc on the Physics of Water.

2.6. Development work is also being carried out on computer-controlled audio systems, for use in audio-enhanced CBL, e.g. using verbal rather than screen text instructions and explanations, and in computer-controlled audio, e.g. for language learning.

3. The Potential of Videodiscs in Schools

3.1. VHD Videodisc players are now available for as little as £250, although the lowest cost Laservision Systems cost about £500. Commercial discs (e.g. a Natural History disc on 'Whales') retail at around £12 to £20. Assembling a computer-controlled videodisc system, assuming a school already has a BBC micro with monitor and disk drive, would add a further £100 or so for the interface, cable and authoring chip.

3.2. A videodisc system can be used in two pedagogically distinct ways: as a self-instructional tool for an individual or small group of pupils, and as a classroom resource for the teacher. Neither requires the use of computer program control; the former can certainly be enhanced by it, however.

3.3. In a study of interactive videodiscs in primary schools, Mably showed that the self-instructional format, using a videodisc player with commercially available videodiscs, was feasible in the primary classroom: that children enjoyed and made good use of it, and that teachers could integrate it easily with other class and individual teaching methods (Mably 1983). The format of the discs used was mainly linear motion video with an indexing system to allow pupils to use particular sections suggested by the teacher.

3.4. Alternatively, the teacher could use it as a classroom resource, where the videodisc provides an indexed slide-bank with short sections of motion, for use in supporting classroom teaching and demonstrations. With the considerable storage capacity of the videodisc (see 1.1) a single disc could usefully give support to an entire curriculum subject.

3.5. Both formats could make use of existing video and slide material, if that were available (perhaps from the broadcasting organisations). In either case, the material must be comprehensively indexed to enable the teacher to use it in the context of their own lesson design, whether for individual projects, in the case of self-instructional use, or for classroom teaching.

3.6. The third possible way to use interactive video is to control its use with an external computer program, designed to support a teaching dialogue with the pupil, and to govern the use of the videodisc material where necessary. This has the advantage that it can automate the teaching by testing and giving feedback where necessary, without any supervision from the teacher. It has the disadvantage of being much more expensive, because bother video material and computer software have to be specially designed, and carefully integrated.

This makes it difficult to use existing video material, as OU experience has shown. The OU discs have made use of existing material, but this prolongs the design stage and it always has to be supplemented with new material. Authoring systems are available to enable non-programmers to design their own computer software, but teachers will need training in how best to work within the inherent deficiencies of these systems (such as the tendency to favour muptiple choice questions) and create educationally useful material from them.

3.7. Development costs of a simple compilation videodisc alone (without computer control) are around £20,000 to £30,000, so that they would have to sell to at least 2-3000 schools for the costs to be covered at £10 per disc. It is likely, therefore, that at least 5000 schools need to be equipped with videodisc players before the courseware market takes off. Costs for computer-controlled videodiscs would be much higher (to take into account the development of more new video material, the software, and the integration of the two), at around £50-150,000.

3.8. Educational publishers will only take an interest in the schools market when there is widespread availability of the appropriate hardware; conversely, schools will only take an interest in the hardware when there is sufficient good quality courseware at a reasonable price, and when they can see that the medium will be of noticeable educational benefit to a reasonable number of pupils.

3.9. The amount of pupil learning-time a videodisc can support depends so much on the deployment of the material that this is very difficult to estimate. For example, a set of just 50 slides could support quite a detailed experiment on genetics, which together with paper-based exercises could take a pair of pupils a good hour or so to work through. On the other hand, poorly designed or over-simplistic material can be worked through in very little time.

3.10. Everything depends, therefore, on the availability of sufficient good quality interactive video material. The lessons from the experience with CAL courseware development for schools should warn us that we cannot expect good courseware to be generated from (a) shoe-string budgets, (b) dedicated enthusiasts working in their spare time, (c) independent organisations. A better model is BBC Education, or (we would like to suggest) the Open University, where a small central group of professionals with good resource support are able to develop the highest possible standards for the medium concerned. Computer-controlled interactive video is a very complex medium that requires a team of design experts, including instructional design skills, content specialism, computer Software skills, and video production skills, within a strong framework of instructional design. Resource discs may make use of existing material to a large degree, but they also need careful structuring and interface design if they are to be usable by naive users, and used to support interactive learning.

Thus it will be necessary to develop new techniques of design and production, beyond those currently in use for linear broadcast video and for CAL; this requires well-resourced interactive video development centres, staffed by professional instructional designers who are capable of carrying out the full range of instructional design tasks from needs analysis to validation. Moreover, if resource discs are to be made for either individual or classroom use, their take-up will depend very much on how closely they fit in with teachers' perceived needs. It is important that any courseware development be carried out in close consultation with teachers and school curriculum advisers.

3.11. If interactive video is to be introduced into schools, teachers will need training in the use of the new medium, and this must be costed into the programme from the outset. For minimal use of pre-packaged courseware, a teacher would need a one-day hands-on workshop. To be able to develop computer programs to control a videodisc, they would need at least a 40-hour course, although this could be taught adequately through distance learning methods. Teachers will be more willing to use interactive video, and will be better able to use it to maximum effect if they are properly trained. With such an expensive medium, it is vital to get the maximum pedagogic value from it.

3.12 The uses of interactive video should always attempt to exploit the unique features of the medium, in order to ensure that its use is strictly necessary. A videodisc operated by a keypad alone allows the user to engage in activities such as

exploring a pictorial database (e.g. botanical typologies, the structure of the combustion engine)

comparing and contrasting visual images (e.g. architectural forms, micrographs of metals)

interpreting visual images or data (e.g. molecular structures, imagery in paintings)

making observations based on stills or motion (e.g. genetic changes in a population, bird flight)

experiencing fixed option control of the development of a sequence (e.g. surrogate travel, simulated experiments, alternative narratives)

With the addition of the testing, feedback and increased user control provided by program control of the videodisc, it is more likely that stable learning will result from these activities (assuming the programe is well-designed) than if the feedback has to come from the human teacher.

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